

INCH-POUND

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9 July 2004  
SUPERSEDING  
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8 July 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, POWER  
TYPE 7609

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Tetrode.

See figure 1.

Mounting position: Any.

Weight: 4 ounces nominal.

ABSOLUTE RATINGS: F1 = 150 MHz; F2 = 500 MHz.

Parameter:	Ef	Eb	Ec1	Ec2	Ehk	Ib	Pg1	Pg2	Pp
Unit:	V ac <u>2</u> /	V dc	V dc	V dc	V dc	mA dc	W	W	W
<u>Maximum:</u>									
C Teleg: (Up to F1)	---	2,000	-250	300	±150	250	2	12	250
C Teleg (F1 to F2)	---	1,250	-250	300	±150	250	2	12	250
Test conditions:	26.5	2,000	Adjust	300	0	150	---	---	---

ABSOLUTE RATINGS: F1 = 150 MHz; F2 = 500 MHz.

Parameter:	T (base seal)	T (anode seal)	T (anode core)	tk
Unit:	°C <u>1</u> /	°C <u>1</u> /	°C <u>1</u> /	sec (min)
<u>Maximum:</u>				
C Teleg: (Up to F1)	175	200	250	30
C Teleg (F1 to F2)	175	200	250	30
Test conditions:	<u>3</u> /	---	---	120

GENERAL:

Qualification: Required.

TABLE I. Testing and inspection.

Inspection	Method MIL-STD- 1311	Conditions	Acceptance level <u>10/</u>	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 1</u>							
Pulsing emission	2212	Eb = Ec2 = 250 V dc; Ec1 = -100 V dc; egk/ik = 1.5 a; pr = 11 ± 1; tp = 4,500 μs min.; Ef = 23.8 V ac; tr = tf = 25 μs max; slope = 0.5 percent max; ripple = 0.1 percent max	0.65	Δik	---	200	ma
Electrode current (screen) (1)	1256	Eb = 1,000 V dc	0.65	Ic2	-3	+5	mA dc
Electrode current (screen) (2)	1256	Eb = 200 V dc; Ec2 = 150 V dc; Ec1/Ib = 150 mA dc	0.65	Ic2	+5.0	---	mA dc
Electrode voltage (grid)	1261	Eb = 1,000 V dc	0.65	Ec1	-32	-46	V dc
Total grid current	1266	Ib = 125 mA dc <u>5/</u>	0.65	Ic1	---	-15	μA dc
Current division (method A, long pulse)	1372	Eb = Ec2 = 250 V dc; Ec1 = -100 V dc; egk/Ib = 1.0 a; pr = 11.0 ± 1.0; tp = 4,500 μs (min)	0.65	egk ic1 ic2	8 --- ---	18 250 260	v ma ma
Primary grid emission (control)	1266	Ic1 = 70 ma dc; t = 15; anode and screen grid floating	0.65	Isg1	---	-25	μA dc
Primary grid emission (screen)	1266	Ec1 = 0; Ic2 = 100 mA dc; t = 15; anode floating	0.65	Isg2	---	-250	μA dc
Heater current	1301		0.65	If	0.40	0.62	A ac
<u>Conformance inspection, part 2</u>							
Power output (1)	---	F = 150 MHz; Ec1 = -90 V dc; Ic1 = 25 mA dc max; Eg1/Ib = 250 mA dc	---	Po	225	---	W (useful)
Power output (2)	2214	Class C amplifier; Ef = 24.3 V ac; F = 460 to 490 MHz; Eb = 1,250 V dc; Ec1 = -90 V dc; Ec2 = 250 to 300 V dc; Ic1 = 20 mA dc max; Eg1/Ib = 250 mA dc <u>6/</u>	---	Po	145	---	W (useful)

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Conditions	Acceptance level 10/ 10/	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection,</u> <u>part 2</u> - Continued							
Amplification factor	1316	g1 - g2; Ec2 = 300 V dc; Ic2 = 50 mA dc; anode floating	---	Mu	4.0	6.0	---
Direct-interelectrode capacitance	1331	EIA standard shield No. 320 and No. 321, or equal	----	Cgp Cin Cout	--- 14.5 3.7	0.05 17.0 4.45	pF pF pF
Heater-cathode leakage	1336	Ehk = +150 V dc; Ehk = -150 V dc	---	Ihk Ihk	--- ---	150 150	μA dc μA dc
<u>Conformance inspection,</u> <u>part 3</u>							
Life-test (1) provisions	---	Group C; power output (1); t= 500 hours	---	---	---	---	---
Life-test (1) end points:	---						
Pulsing emission	2212	Ef = 26.5 V ac	---	Δik	---	+100	ma
Primary grid emission (control)	1266		---	Isg1	---	-100	μA dc
Primary grid emission (screen)	1266		---	Isg2	---	-250	μA dc
Heater-cathode leakage	1336	Ehk = +150 V dc Ehk = -150 V dc	---	Ihk Ihk	--- ---	150 150	μA dc μA dc
Life-test (2) provisions	---	Group C; Ec1 = Ec2 = Eb = 0; Ef = 29.1 V ac; t = 500 hours	---	---	---	---	---
Life-test (2) end point:	---						
Interelement leakage resistance (cold)	1366	Supply voltage = 500 V dc; Rs = 2.5 MegΩ g2 positive g2 positive g1 negative Z/	---	Rg1g2 Rg2k Rg1k	10 10 10	--- --- ---	MegΩ MegΩ MegΩ
Life-test (3) provisions	---	Group D; power output (2) t = 500 hours 9/	---	---	---	---	---
Life-test (3) end points:	---						
Pulsing emission	2212	Ef = 26.5 V ac	---	Δik	---	+100	ma
Primary grid emission (control)	1266		---	Isg1	---	-100	μA dc
Primary grid emission (screen)	1266		---	Isg2	---	-250	μA dc
Heater-cathode leakage	1336	Ehk = +150 V dc Ehk = -150 V dc	---	Ihk Ihk	--- ---	150 150	μA dc μA dc

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Conditions	Acceptance level 10/	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 3</u> - Continued							
Coolant pressure drop versus coolant flow (forced air)	1155	No voltages 4/ 9/	---	---	---	0.60	Inch of water
Shock, specified pulse	1042	No voltages; accel = 15G peak (min); D = 11 ± 2 ms half-sine wave 8/	---	---	---	---	---
Shock, end points:	---						
Electrode voltage (grid)	1261		---	Ec1	-32	-46	V dc
Total grid current	1266		---	Ic1	---	-15	µA dc
Sweep-frequency vibration	1031	No voltages; 10 G; F = 25 to 2,000 Hz 8/	---	---	---	---	---
Vibration end points:	---						
Electrode voltage (grid)	1261		---	Ec1	-32	-46	V dc
Total grid current	1266		---	Ic1	---	-15	µA dc

- 1/ When the tube is operated at 100 percent of maximum rated anode dissipation at an incoming air temperature of 25°C maximum, a minimum airflow of 5.6 cfm at sea level shall pass through the anode cooler. The static pressure drop across the anode cooler at this flow is approximately 0.26 inch of water. If the socket on Drawing 246-JAN is used, an incoming airflow of 5.6 cfm to the grid end of the socket is required. At this flow of 5.6 cfm, the static pressure drop directly across the tube and socket is approximately 0.60 inch of water. This pressure drop varies with the amount of escaping air and with the shape and construction of the air director. The airflow rating applies at bias voltage less than 100 volts and frequencies less than 500 MHz. Air cooling of the tube shall be increased with increased negative grid bias, increased incoming air temperature, or increased frequency of operation, or a combination. In all cases of operation, a socket which provides forced-air cooling of the base shall be used and maximum seal and radiator temperature ratings shall not be exceeded. The airflow shall be applied before or simultaneously with electrode voltages, and may be removed simultaneously with them.
- 2/ The filament voltage is  $26.5 \pm 10$  percent but when long life and consistent performance are factors, it is recommended that the voltage be held at  $\pm 5$  percent. Maximum life may be obtained by adjusting the heater voltage in accordance with the application. A table of heater voltage versus frequency is presented as a guide.

<u>Frequency (MHz)</u>	<u>Ef (Vac)</u>
Up to 300	26.5
301 to 400	25.5
401 to 500	24.3

- 3/ In all cases of electrical tests involving application of heater voltage, the socket on Drawing 246-JAN shall be used. An incoming airflow of 6.0 cfm maximum to the grid end of the socket is permitted.
- 4/ An infinite baffle system as shown on figure 2, or equal, with an airflow of 5.6 cfm at sea level shall be used. The static pressure drop is measured across the tube and socket.
- 5/ This test is to be the first test performed at the conclusion of the holding period.
- 6/ Circuit and cavity shall be in accordance with Drawing 223-JAN.
- 7/ This test shall be made a minimum of 30 minutes after Ef is turned off. Rated airflow shall be maintained during the 30-minute interval.

TABLE I. Testing and inspection - Continued.

8/ Test to be performed every three months, using the following sampling plan:

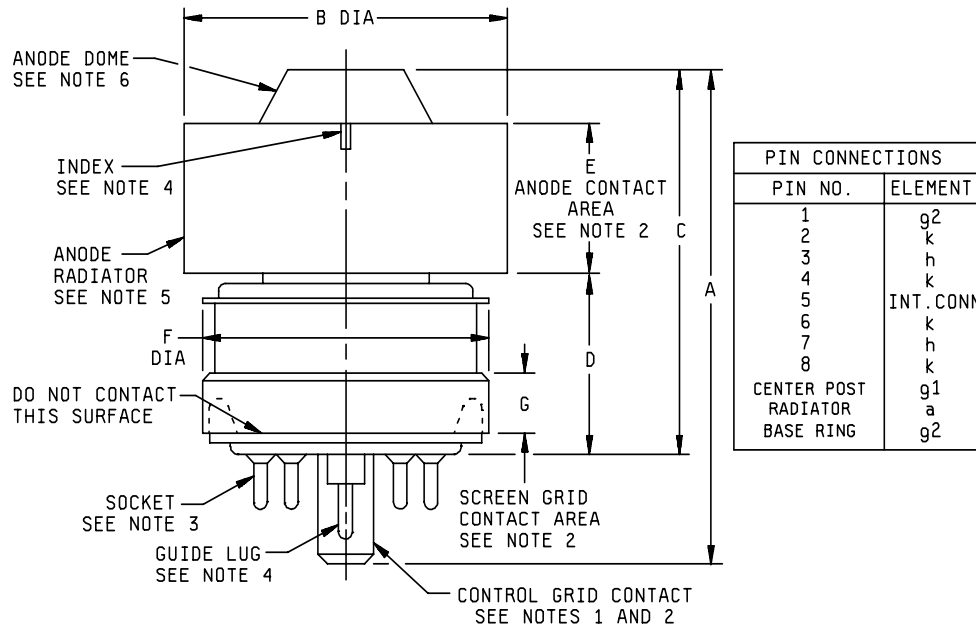
$n1 = 4$                        $c1 = 0$

Separate samples may be used at the option of the manufacturer, and the tests shall be considered as nondestructive except in case of failure. In case of failure, after sampling, the failing test shall become a conformance inspection, part 2, acceptance level 6.5 (see 10/) for three consecutive successful submissions, at which time the testing may revert to the periodic-check test basis.

9/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2 (see 10/), with an acceptance level of 6.5. The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

10/ This specification sheet uses an accept on zero defect sampling plan in accordance with MIL-PRF-1, table III.

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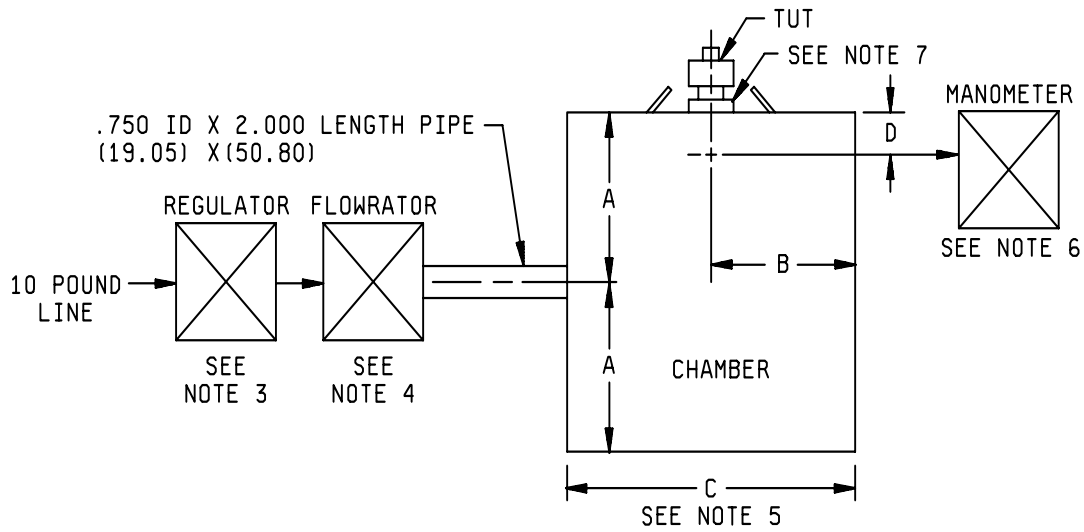


Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	2.224	2.404	56.49	61.06
C	1.710	1.850	43.43	46.99
Conformance inspection, part 3 (periodic check) (see note 7)				
B	1.610	1.640	40.89	41.66
D	.750	.810	19.05	20.57
E	.710	.790	18.03	20.07
F	---	1.406	---	35.71
G	.187	---	4.75	---
H	Base: B8-236 (see note 4)			

NOTES:

- Pin alignment shall be checked by means of JEDEC gauge GB8-3. Dimensions of control-grid contact shall be inspected by means of gauges specified on Drawing 246-JAN and shall be conformance inspection, part 2.
- Alignment of anode, screen grid, and control-grid contact surfaces shall be determined by means of gauge specified on Drawing 168-JAN. Conformance inspection, part 2, shall apply.
- Air system socket shall be as specified on Drawing 246-JAN.
- Location of guide lug of control-grid contact may be referenced by a notch or arrow on the anode radiator in the position shown.
- Anode clamping shall be confined to the anode radiator.
- Dome contour shall be such that it will be contained within cross-hatched area of template shown on figure 3. Optical comparator techniques are normally used for this purpose.
- Dimensions shall be checked during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with the first three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 10/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

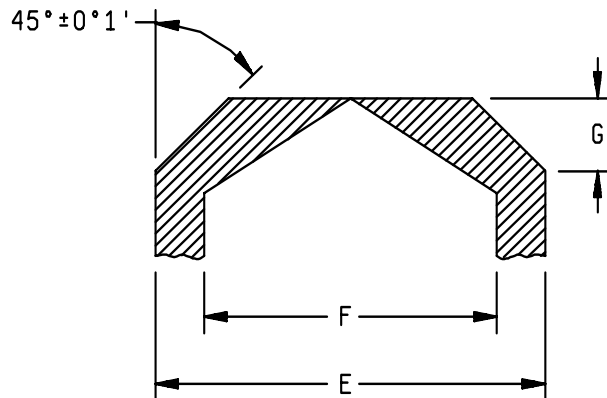
FIGURE 1. Outline drawing of electron tube type 7609.



## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are based upon 1.00 inch = 25.4 mm.
3. Fisher-Governor, Pressure Regulator Model 67, or equal.
4. Fisher-Porter Flowrator Model B4-27-10/77, or equal.
5. 12 inch (304.80 mm) cube inside dimensions, compound sealed, or equal.
6. F. W. Dwyer Manometer, 0 to 1 inch (25.4 mm) of water (Fisher Scientific Company 11-295-5 Draft Gage), or equal.
7. Socket specified on Drawing 246-JAN.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Figure 2				
A	5.995	6.005	152.27	152.53
B	5.995	6.005	152.27	152.53
C	11.995	12.005	304.67	304.93
D	1.995	2.005	50.67	50.93
Figure 3				
E	.9995	1.0005	25.387	25.413
F	.6995	.7005	17.767	17.793
G	.1895	.1905	4.813	4.839

FIGURE 2. Block diagram.FIGURE 3. Contour limits of dome shape.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet references MIL-STD-1311, drawing 246-JAN and drawing 223-JAN.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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Navy - EC  
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Review activities:

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